

## D E S C R I P T I O N

METHOD OF FIXING FLAVORANT WHICH IMPROVES  
SIDESTREAM SMOKE SMELL OF TOBACCO AND  
CIGARETTE

5

## Technical Field

The present invention relates to a method of  
fixing a flavorant which improves the smell of  
sidestream smoke of tobacco, as well as a cigarette,  
and more specifically, to a method of effectively  
fixing a flavorant on a tobacco wrapper paper without  
substantially modifying a flavorant to be fixed, as  
well as a cigarette.

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## Background Art

A number of flavorants are added to tobacco  
articles, such as cigarettes, to create various types  
of tastes and aromas of tobacco smokes. In general,  
many kinds of volatile flavorant are blended and added  
to tobacco articles to create a distinctive impression  
of an individual tobacco product. In recent years, to  
improve the smell of the sidestream smoke released to  
the ambient during smoking, it has been proposed to  
add, to cigarette paper, a flavorant that masks the  
unpleasant smell.

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The flavorants, which are added to cigarette paper  
to improve the smell of the sidestream smoke, are  
required to have properties, including those properties  
that the flavor is not released undesirably to the site

where the tobacco article is produced, that the flavorant is not transferred to other materials while the tobacco article is in storage, and yet that the flavorant is selectively released in the sidestream smoke during smoking in order to improve the smell of the sidestream smoke. In order to establish such a smell-improving technique, there must be provided a flavor-releasing agent which can suppress the volatilization of the flavorant to a low level, and is stable and non-volatile under production and storage conditions, and yet which releases the flavor by thermal decomposition or desorption during smoking.

As such a technique, Jpn. Pat. Domestic Announcement No. 2-501075 (US Patent 4,804,002) discloses a technique of converging a flavorant into its glycoside, and Jpn. Pat. Appln. KOKAI Publication No. 5-146285 (US Patent 5,144,964) and Jpn. Pat. Domestic Announcement No. 7-504080 (US Patent 5,479,949) disclose a technique of clathrating a flavorant by cyclodextrin.

Incidentally, it is strongly desired that the masking flavorants used to improve the smell of the sidestream smoke should be used while being blended with various kinds of volatile masking flavorants so as to assure the unique aroma of the smoke that each type of the tobacco products has, as in the case of the general flavorant discussed above. However, the

masking flavorants solved by the above-described technique are restricted by the synthesizing method in the technique of converting into glycoside and by the physical conditions of the enclosing cavity in the clathrate technique with cyclodextrin. Further, these techniques cannot deal with blended flavorants.

On the other hand, the taste and smell of a cigarette are created by smoking it, and the generation mechanism of the taste and flavor is an aggregate of considerably complicated processes. For example, generation of smoke component by, e.g., chemical reactions such as combustion reaction and oxidization reaction, evaporation and a distillation process and delivery of a smoke component by a transfer process such as dilution, diffusion or filtration are interacted with each other. Therefore, if a novel compound or additive which has not been conventionally available is used as a flavorant-holding member (fixing medium), an unexpected byproduct may be created due to the above complicated processes, which may bring about a negative affect on the taste and aroma of the cigarette. As a result, a great deal of efforts may be required to remove the negative effect in order to produce satisfactory taste and flavor.

In summary, as a generally employable flavor-holding and fixing technique used in the production of tobacco articles, a technique which does not affect

the generation and delivery of smoke components, that is, a flavor-fixing technique which does not use a novel compound or additive is desirable.

Therefore, firstly, it is an object of the present invention to provide a method of fixing flavorants which improve the smell of sidestream smoke of tobacco, such that the flavorants can be stably held on tobacco wrapper paper during storage and can release the flavor which improves the smell of the sidestream smoke during smoking.

A second object of the present invention is to provide a method of effectively fixing, to tobacco wrapper paper, existing flavorants for improving the smell of sidestream smoke without a special modification made to the flavorant.

#### Disclosure of Invention

The inventors of the present invention carried out extensive studies in order to achieve the above objects, and have found that an emulsion of an ethylene-vinyl acetate copolymer (hereinafter referred to as "EVA"), if it has a specified range of ethylene contents, is very effective as a medium for fixing a flavorant(s) for improving the smell of sidestream smoke of the tobacco (hereinafter referred to also as "masking flavorant"), and there is no need then to effect special modifications (e.g., reactions with other compound, clathrations) to the flavorant.

At the same time, they have also found that the solid content of the EVA emulsion influences the stable retention of the masking flavorant. Further, the inventors of the present invention have found that when  
5 a masking flavorant is added to an EVA emulsion, it is effective that the masking flavorant is added as an ethanol or propylene glycol solution, and, in that case, the amount of the ethanol or propylene glycol added as a solvent influences the stable retention of  
10 the masking flavorant. Then, they have accomplished the present invention by studying these factors.

Thus, according to the present invention, there is provided a method of fixing a flavorant for improving the smell of a sidestream smoke of tobacco, comprising  
15 the steps of: applying, to tobacco wrapper paper, a tobacco sidestream smoke smell-improving agent comprising an ethanol or propylene glycol solution of a flavorant for improving the smell of the sidestream smoke of tobacco added to an emulsion of an ethylene-  
20 vinyl acetate copolymer having an ethylene content of 30% by weight or less, said emulsion having a solid content of 10 to 60% by weight; and drying the improving agent to fix the flavorant to the wrapper paper with said ethylene-vinyl acetate, wherein  
25 the ethanol solution of the flavorant is added to the emulsion such that an amount of ethanol is 40 parts by weight or less with respect to 100 parts by weight

of the emulsion, or the propylene glycol of the flavorant is added to the emulsion such that an amount of propylene glycol is 11 parts by weight or less with respect to 100 parts by weight of the emulsion.

5 Further, according to the present invention, there is provided a cigarette having a tobacco rod wrapped by tobacco wrapper paper to which a masking flavorant is fixed by the method of the present invention. In this case, it is most preferable that the EVA emulsion  
10 should be applied in the form of a seam adhesive at a seamed portion of the tobacco wrapper paper.

#### Brief Description of Drawings

FIG. 1 is a graph illustrating the relationship between the solid content of an EVA emulsion and  
15 a remaining amount of a masking flavorant;

FIG. 2 is a graph illustrating an influence on an EVA emulsion by an addition of ethanol; and

FIG. 3 is a graph illustrating an influence on an EVA emulsion by an addition of propylene glycol.

20 Best Mode for Carrying Out of the Invention

The present invention will now be described in more details.

The present invention is basically a technique of fixing a masking flavorant with EVA by adding the  
25 masking flavorant in the form of an ethanol or propylene glycol solution to an EVA emulsion (usually aqueous emulsion), applying the resultant mixture

(tobacco sidestream smoke smell-improving agent) to tobacco wrapper paper and then drying the mixture. As the mixture is dried, a surface barrier layer (made of EVA which retains the masking flavor) is  
5 formed, which suppresses volatilization of the masking flavorant.

In the present invention, an EVA used as a fixing medium for the masking flavorant has an ethylene content of 30% by weight or less. If the ethylene  
10 content exceeds 30% by weight, a sufficient fixing effect cannot be exhibited. The lower limit of the ethylene content of the EVA is usually 0.01% by weight. An EVA emulsion used in the present invention can be employed as a seam adhesive used in a high-speed  
15 cigarette-making machine. It should be noted that the ethylene content of the EVA used should preferably be low, and more preferably, it should be 8% by weight or lower. Further preferably, the EVA has an ethylene content of 0.01% by weight to 7% by weight.

20 In the present invention, the EVA emulsion has a solid (EVA) content within a range of 10 to 60% by weight. If the solid content is less than 10% by weight, the amount of EVA, the solid component, becomes insufficient, resulting in that the masking flavorant  
25 cannot be sufficiently held and fixed. On the other hand, when the solid content exceeds 60% by weight, a sufficient flowability of the EVA emulsion cannot be

achieved, and therefore a dense barrier layer cannot be formed. The EVA emulsion should preferably have a solid content within a range of 15 to 55% by weight.

5 In the present invention, the masking flavorant fixed by the EVA emulsion is not limited particularly as long as the flavorant is of a type which can be used normally as a masking flavorant, and it can be used as it is without any modification. Examples of such a masking flavorant are terpenes, esters, alcohols such  
10 as linalool, nerol and geraniol, phenols including anethole, aldehydes such as vanilline and ethyl vanilline, lactones, and plant and fruit extracts. They can be used singly or in the form of a mixture (blended flavorants) as desired.

15 In the present invention, tobacco wrapper paper serving as a substrate on which a masking flavorant is fixed is wrapper paper for paper-wrapped tobacco (cigarette), and any wrapper papers that are usually employed can be used.

20 In order to fix a masking flavorant on a wrapper paper according to the present invention, firstly, one or more masking flavorants are added in the form of ethanol or propylene glycol solution to an EVA emulsion. In the case where ethanol is used as  
25 a solvent, the ethanol solution of the flavorant is added such that an amount of the ethanol solvent is 40 parts by weight or less with respect to 100 parts by



weight of the EVA emulsion. The amount of ethanol added is usually 0.01 parts by weight or more. Preferably, the ethanol solution of the flavorant is added such that an amount of ethanol is 0.01 parts by weight to 10 parts by weight with respect to 100 parts by weight of the EVA emulsion. Meanwhile, in the case where propylene glycol is used as a solvent, the propylene glycol solution of the flavorant is added such that an amount of the propylene glycol is 11 parts by weight or less with respect to 100 parts by weight of the EVA emulsion. The amount of propylene glycol added is usually 0.01 parts by weight or more. Preferably, the propylene glycol solution of the flavorant is added such that an amount of propylene glycol is 0.01 parts by weight to 5 parts by weight with respect to 100 parts by weight of the EVA emulsion. If the amount of the respective solvent added exceeds the upper limit noted above, the fixing of the masking flavorant will be adversely affected, and it becomes difficult to apply it as a seam adhesive. The amount of the masking flavorant added should preferably be 0.001 to 30% by weight based on the weight of the EVA emulsion. After adding the solution of the masking flavorant, the resultant EVA emulsion is sufficiently mixed to uniform.

Then, the EVA emulsion to which the masking flavorant solution has been added (tobacco sidestream

smoke smell-improving agent) is applied (coated) to tobacco wrapper paper. It has been found that in the application of the tobacco sidestream smoke smell-improving agent to the tobacco wrapper paper, the releasing rate of the flavorant into the sidestream smoke is significantly higher in the case where it is applied onto the outer surface of the wrapper paper than in the case where it is applied onto the inner surface (which is the surface on the cut tobacco side) of the wrapper paper. It should be noted here that the tobacco sidestream smoke smell-improving agent may be applied not on the entire surface of the wrapper paper, but applied as one or more lines on the paper in its longitudinal or lateral direction. However, since the tobacco sidestream smoke smell-improving agent of the present invention can be used as a seam adhesive as noted above, the tobacco sidestream smoke smell-improving agent can be put into an adhesive tank on a cigarette-making machine, and it can be directly used as the seam adhesive. With this, there is no need to remodel the existing facilities or to provide an additional device, but the existing facilities can be used as they are, so as to fix the masking flavorant on the wrapper paper and make cigarettes. In this manner, the increase in the cost can be suppressed.

After the tobacco sidestream smoke smell-improving agent is applied to the wrapper paper, it is dried.

Usually, the drying can be effected at a temperature ranging from room temperature to 300°C for 0.001 second to several minutes. When the tobacco sidestream smoke smell-improving agent is applied as the seam adhesive, the usual drying conditions for a conventional seam adhesive can be used.

The masking flavorant thus fixed on the wrapper paper by means of the EVA emulsion, when the amount of addition is low, does not generate aroma under ordinary tobacco articles production and storage conditions, but when smoked, it effectively release aroma so as to improve the smell of the tobacco sidestream smoke. In this respect, the present invention can be clearly distinguished from the aroma-releasing agent prepared by mixing a flavorant into a grain or pellet form of EVA. Further, in the present invention, there is no mutual interaction between the EVA and the flavorant.

A tobacco rod can be wrapped with wrapper paper to which the masking flavorant is fixed according to the present invention. A cigarette having this tobacco rod can be suppressed of unpleasant smell of the sidestream smoke during smoking.

It should be noted that the EVA emulsion to which the masking flavorant is added can be applied to a wrapper paper during wrapper paper-making processes.

Examples of the present invention will now be described; however the invention should not be limited

to these Examples. In these Examples, an EVA having an ethylene content of 7% by weight was used.

#### Example 1

In this example, a relationship between a solid  
5 content of an EVA emulsion and a aroma-retaining  
property was studied. EVA emulsions of various water  
contents, from 0% to 100%, were used in the test.

About 0.2 g of the respective EVA emulsion was put  
into a container having a gas inlet and a gas outlet,  
10 and an ethanol solution of linalool was added to the  
emulsion such that an amount of linalool became 1% by  
weight. Then, the container was placed in an air bath  
at a temperature of 80°C, and nitrogen gas was supplied  
from the gas inlet at a flow rate of 40 cc/min so as to  
15 dry the linalool-added EVA emulsion over a period of  
24 hours. Thereafter, each of the dried samples was  
heated at 300°C for one hour so as to desorb the  
linalool, and the concentration thereof (linalool  
remaining amount) was measured with a gas  
20 chromatography (GC). FIG. 1 shows the relationship  
between a solid content of the EVA emulsion and a  
linalool remaining amount of the respective dried  
sample. As can be seen from FIG. 1, in the case where  
a solid content of the EVA emulsion is in a range of 10  
25 to 60% by weight, the linalool remaining amount  
significantly improves. When a solid content of  
the EVA emulsion exceeds 60% by weight, EVA is gelled

and the surface barrier layer is not formed densely.  
On the other hand, when a solid content of the EVA  
emulsion is less than 10% by weight, the amount of the  
solid becomes insufficient, and therefore the surface  
5 barrier layer is not formed densely.

#### Example 2

In this example, an influence of the amount of  
a solvent (ethanol or propylene glycol) added to EVA  
emulsion was studied.

10 An ethanol or propylene glycol solution, in which  
linalool was dissolved, was added in various amounts to  
100 parts by weight of an EVA emulsion (solid content  
of 47% by weight; water content of 53% by weight) such  
that the amount of linalool became 1% by weight (In any  
15 case, the amount of linalool was 1% by weight with  
respect to the total amount of the EVA emulsion and the  
linalool solution). Using the thus-obtained tobacco  
sidestream smoke smell-improving agents, similar tests  
to those of Example 1 were carried out to measure the  
20 linalool remaining amount (% by weight) in each case.  
The results are shown in FIG. 2 (in the case of the  
ethanol solution) and FIG. 3 (in the case of the  
propylene glycol solution). As can be seen from  
FIG. 3, in the case of using the ethanol solution, when  
25 an addition amount of ethanol as a solvent exceeds  
40 parts by weight with respect to 100 parts by weight  
of the EVA emulsion, the linalool remaining amount

decreases. This is because the EVA emulsion was gelled, and therefore a dense barrier layer was not formed. On the other hand, as can be seen from FIG. 4, in the case of using the propylene glycol (PG) solution, when the ratio of addition of ethanol as a solvent is 11 parts by weight or less with respect to 100 parts by weight of the EVA emulsion, the linalool remaining amount is stabilized.

### Example 3

10 The sidestream smoke smell-improving agents consisting of the EVA emulsions to which the linalool solutions were added, as prepared in Example 2, were used as seam adhesive, and cigarettes were made with tobacco wrapper paper using a cigarette-making machine.

15 The amount of the seam adhesive added was 2g at maximum per cigarette. In the case where the ethanol solution was used, when an addition amount of ethanol as a solvent exceeds 40 parts by weight with respect to 100 parts of the EVA emulsion, the EVA emulsion was gelled.

20 On the other hand, in the case where the propylene glycol solution was used, when an addition amount of propylene glycol as a solvent exceeds 11 parts by weight with respect to 100 parts of the EVA emulsion, the seam adhesive could not be sufficiently dried,

25 thereby causing adhesion failure of the wrapper paper.

It should be noted that in the above-described Examples, linalool was used as a masking flavorant;

however, with other masking flavorants (such as ethyl vanillin and blended flavorant (mixture of 4 flavorant, namely, prune-based, honey-based, tea-based and fruity-based flavors), similar results were obtained.

5           As has been described above, according to the present invention, there is provided a method of fixing a flavorant for improving the smell of sidestream smoke of tobacco, by which the flavorant can be stably held on tobacco wrapper paper during storage, but can be  
10 released during smoking so as to improve the smell of sidestream smoke. Further, according to the present invention, existing flavorants for improving the smell of sidestream smoke can be effectively fixed to tobacco wrapper paper without special modifications made to the  
15 flavorants.